Plutchik‘s Wheel and The Unity of Opposites

(Vortex of Emotions)

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Abstract

Using the pirinciple of the Unity of Opposites, the Plutchik‘s wheel is converted into the „vortex“ model, whereby the most gentle emotions are inside of the wheel, whereas the rudest are outside. This relates emotions to a variety of physical and mathematical phenomena, suggesting that they are at the very source of consciousness and physical reality. The quality of emotions depends on their subtlety and dimensionality – how many oppositions they unite into the “synchronized network”. So, our evolution must be “implosive”, through increasing the dimensionality of emotions, rather than “explosive”, aggressively expanding along the available dimensions. Some of the related psycho-philosophical dilemmas are discussed.

Keywords: Emotions, Plutchik, Unity of Opposites, Causality, Panpsychism

Presently there is no common agreement as to what emotions are (Solomon, 2008; Izard, 2010, Scarantino et al, 2021, Ortony, 2021). I propose to consider them as the fundamental building blocks of our consciousness and reality, based on understanding that emotions dynamically interact with each other, causing dialectic struggle and unification. The "struggle" part was considered by many philosophers and psychologists – from Aristotle (Rapp, 2010) to Plutchik (1958, 1980, 1997) – but the "unification" part was largely ignored. To fix it, the Plutchik's wheel has to be inverted inside out. This yields the "vortex of emotions" that can explain our variable perceptions of reality and suggest the ways of their improvement.

1. Inverting The Plutchik's Wheel

Repulsion *vs*. Attraction. Figure 1 compares the original Plutchik's wheel (1958, 1980) with the inverted one. The original wheel (A) puts the harshest emotions in the center, where they repulse each other. The inversed wheel (B) puts the mildest emotions in the center, where they attract each other. *E.g*., Ecstasy is repulsive to Grief in (A), but Serenity is attractive to Pensiveness in (B). Mild emotions unite into more subtle states, similarly like mild colors yield more subtle paintings. So the center of the wheel becomes like an "art studio of the higher beauty".

Colors and Maturity. The inversed wheel is compatible with the 3D color order systems (reviewed by Nemcsics and Caivano, 2015), providing new insights into the meaning of emotions' scales. Emotion's intensity can be compared to color's chroma, arousal – to color's value and hue. Valence / pleasantness is suggested to be replaced with the "Ability to Unite", representing merely the mutual desirability, "vital" wiseness, subtleness or gentleness. This replacement is not always straightforward, as some emotions may be pleasant, but not permanently uniting (e.g., ecstasy and euphoria), whereas others may be uniting, but unpleasant

(e.g., penitence, pain of growth). The ability to distinguish between these two concepts determines our wisdom, maturity, and the sense of right and wrong.

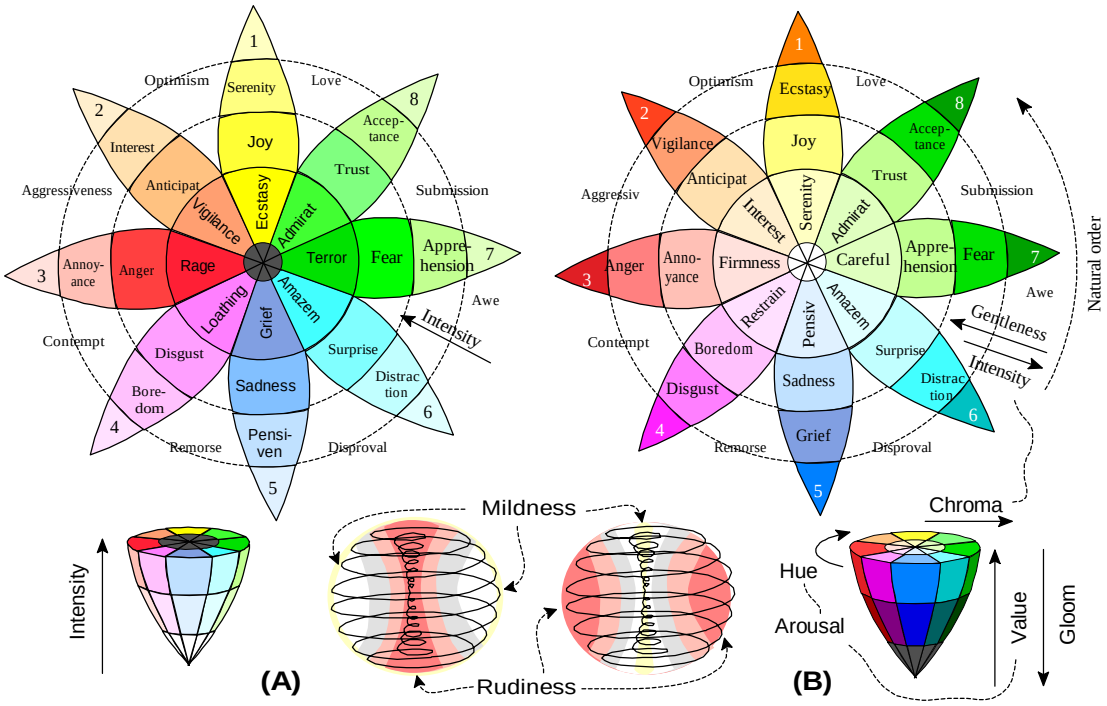


Figure 1. Inversion of Plutchik's Wheel

Maturity *vs.* Intensity. Figure 2 shows the dependence of Subtleness (Ability to Unite) on the layer's number in the Plutchik wheel. Black font indicates the original wheel, red – the adjustments for inversion. Each plot represents a certain petal, and all petals are grouped into pairs of oppositions.

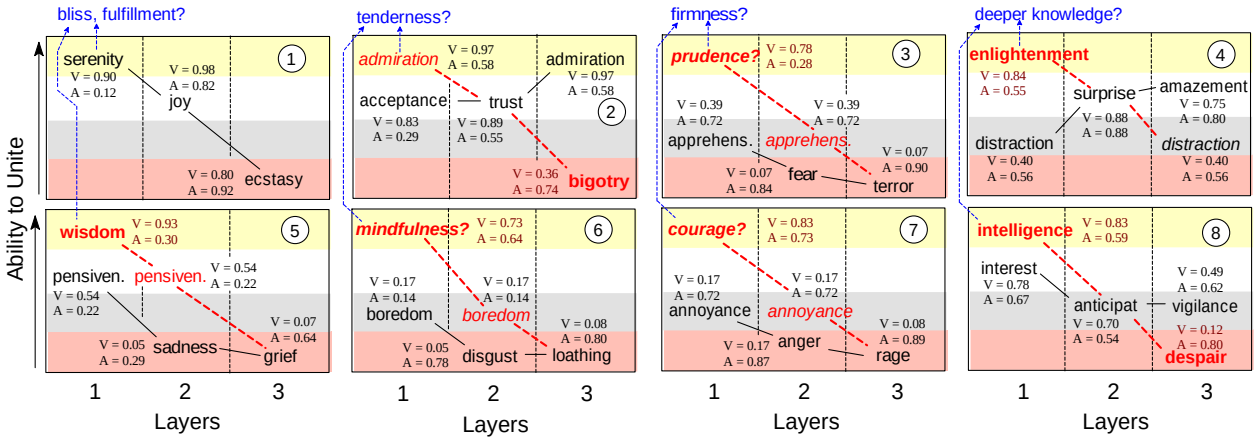


Figure 2. Adjusting to the Principle of Uniting Opposites. Numbers near each word indicate its valence (V) and arousal (A) from Mohammad (2018). Very roughly, they correspond to our "Unification Ability" and intensity, although clearly do not coincide with them.

Black lines show variable patterns, whereas red lines are uniform. Emotions in bold red were not present in the Plutchik's wheel. Most of them are personality traits, but the distinction between emotions and traits is vague (Plutchik, 1980, 1997). Blue text above the plots suggests further direction of their unification, yielding an inverted wheel similar to Figure 1(B). It can be sentimentally related to nearly all phenomena that we can think of, because (i) emotions play the central role in our lives (Strongman, 2003, Thamm, 2006; Zinck et al, 2008), and (ii) there is no limit to the numbers of petals and layers that we can use in the final wheel.

Undefinability of Wisdom. The "Unification Ability" index is self-evident for the simplest emotions, but it may become disputable as their subtlety increases. Note that in Figure 2 red text appears more frequently in the 1st layer than in the 3rd. The increasing subtlety of emotions increases the number of their "orthogonal meanings" (as will be discussed below), so the "Unification" parameter must be also multi-meaning. This makes it different from the "single-meaning" parameters like intensity and pleasantness.

According to the Tarski's undefinability theorem, the (self-evident) truth in the standard model of the system cannot be defined within the system (Tarski, 1983). So only the practical usefulness of the final result – the inverted wheel – can tell us if the core parameters are correct. This is the domain of the circular causation, when the correctness of assumption is proven by the "general normality" of the whole system, rather than the linear causation (Harvey, 2019). Below we will see that disregarding this rule leads to corrupted science and philosophy.

2. Vortex of Emotions

Indivisible Continuum. The inverted wheel forms an indivisible, rotating continuum, as shown on Figure 3(A). It has been flipped relative to the vertical axis (to enable clockwise rotation) and furnished with additional petals and layers. These demonstrate the smoother transitions, like in emotion gradients of Cowen et al (2019), but with more natural "directedness". A more elaborated wheel can be found on the internet (Petrauskas, 2018)

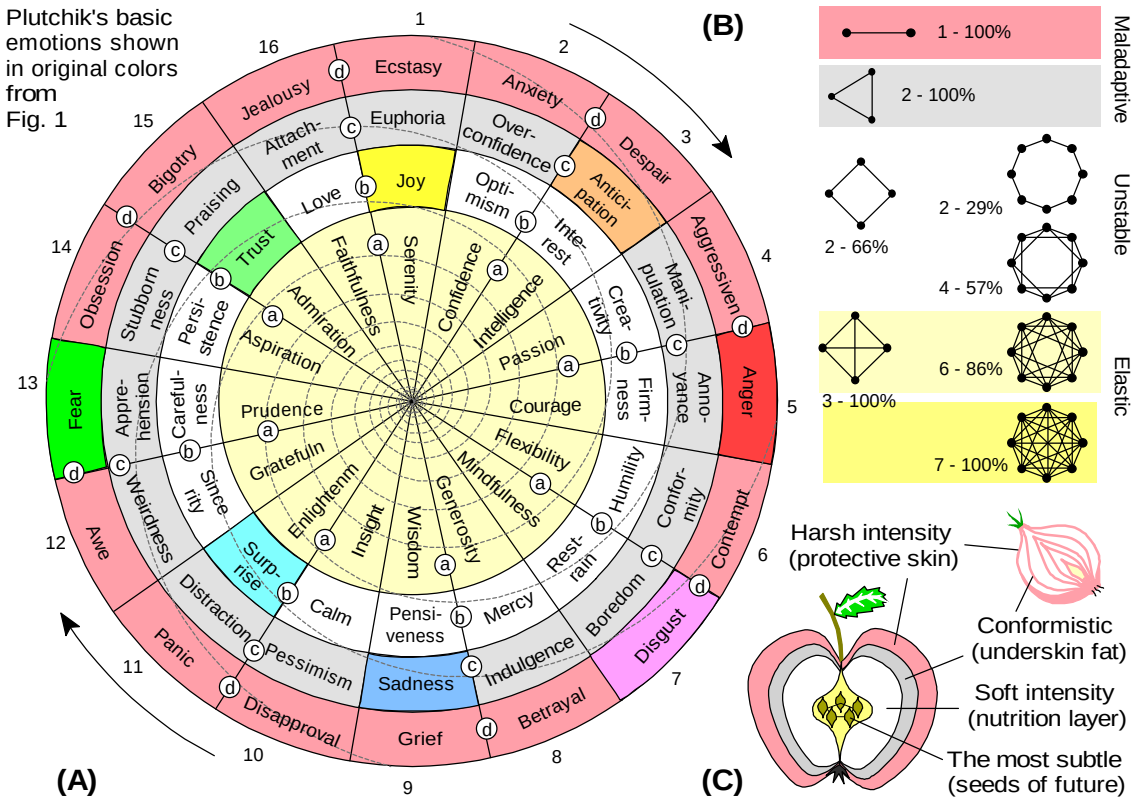


Figure 3. Inverted and extended wheel, Kuramoto oscillators, apple / onion models

Oscillating Networks. The obtained "continuum" produces distinct emotions similar to how a global whirpool produces local turbulences. View it as a mathematical oscillator, that may consist of several smaller oscillators, and be a part of a larger network of oscillators. Such networks can explain all kinds of self-regulations (Strogatz, 2003; O'Keeffe et al, 2017; Townsend et al, 2020). Scheme (B) shows the most probable examples. Each oscillator is coupled with at least two closest neighbors. The higher the coupling level, the higher the stability. If the number of couplings exceeds 75%, such network becomes synchronized (Townsend et al, 2020). It behaves like an indivisible entity, such as a new (more sophisticated) feeling, habit, character trait, or a visionary picture. Otherwise (if couplings are below 75%) it represents a circulating impulse, similar to a rotating vortex that dynamically reacts to the outer space.

Self-Regulation. Any external disturbance activates the opposite side of the vortex. For example, if I am exposed to Fear (13-d), in response I will activate the opposite segment, ranging from Courage (5-a) to Anger (5-d). The actual result depends on my overall stability, or the connectedness of graph. The latter can be judged from the orthogonal segments. If both of orthogonal segments are in white or yellow zone – *i.e.*, I am Joyful (1-b) and Thoughtful (9-b) – then Fear will be transformed to Carefulness (13-b). But if at least one of orthogonal segments falls in grey or red zone – *i.e.*, I am either Euphoric (1-c) or Sad (9-c) – then I will get Annoyed (5-c) and/or Angry (5-d).

Maladaption. Case B shows that red and grey zones produce small graphs leading to maladaptive schemes (described by Young et al, 2003). For example, Anger (5-d) can make a "stable swing" with Fear (13-d), whereas Annoyance (5-c) can form a "manipulative triplet" with Distraction (11-c) and Attachment (16-c). Such networks are synchronized, as their connectedness is 100%. So they are highly stable and act as independent entities while forming more sophisticated maladaptive networks.

Deceptiveness. Grey networks may create an impression that you are in the white or yellow zone. For example, try distinguishing between the Confidence (2-a) and Over-confidence (2-c). The usual verification of the orthogonal segments (in this case 6, 10, 14) may not help, as Over-confidence may be coupled with Self-Indulgence (8-c) and Stubbornness (14-c), both of which bias our judgments. The effect is sharpened by the fact that the white zone is less "intense" and less stable than the grey zone networks. Furthermore, the grey zone may actually "corrupt" the white zone from inside, as will be shown below.

Instability. Oscillating networks in the white zone have low coupling level (< 75%), thus they are non-synchronic and unstable. They resemble the rotating vortices that follow the strict

sequence of transformations. For example, Optimism (2-b) → Humility (6-b) → Calm (10-b) → Persistence (14-b) → … If this sequence is changed, then the network is destroyed.

Agility. Distinctly from the white zone, the yellow is well interconnected, synchronized and stable. So, the true Confidence (2-a) is coupled with Flexibility (6-a), Insight (10-a) and Aspiration (14-a), yielding a 100% coupling (a rectangular graph with cross inside). Often it is assigned to just a single quality: the "Leadership". Such quartets represent a "full" self-regulating capability, enabling the constituents "controllably" extend to other zones, and then come back to the yellow zone. This is called the "emotions' elasticity", and it is lacking in other zones.

For example, sometimes the leader must be over-confident (2-c) or even anxious (2-d), but the remaining leader's qualities get him back to the yellow zone. However, if Insight is replaced with Calm (9-a), or Flexibility (6-a) with Humility (6-b), or Aspiration (14-a) with Persistence (14-b), then Over-confidence and Anxiety will trap us in the lower zones, and "elasticity" will vanish.

Onion *vs.* Apple. Each zone has its own view on the role of other zones. This forms two general worldviews. One considers that everything is based on struggle and competition, another – on integral unification. Figure 3(C) shows it as the onion and apple models. In the onion model, the outer layers hinder and corrupt the inner layers, whereas in the apple model all layers symbiotically support each other under supervision of the inner layers.

Sharper colors in Figure 3(A) show the Plutchik's "basic emotions" that are typical to all people. None of them belong to the yellow zone, suggesting a potential corruption. On the other hand, the yellow zone is monitored by the positive psychologists that advocate the apple.

Corruption. In the onion model the red and grey zones may corrupt the white zone "from inside", yielding various perversions. For example, the Anger may twist the Joy, creating the Malice. The Apprehension and Anxiety may twist the Calm and Safety, creating the Desire of Control. This can further yield various "sugar-coated lies" described in Orwell's books. As will be discussed below, it is such effects that make the Maslow hierarchy reversible. They convert any knowledge into an argument against the Unity of Opposites, explaining the famous Kant's words: "I have therefore found it necessary to deny knowledge in order to make room for faith".

Corruption does not exclude emotional agility, so even the yellow zone might be endangered by it. On the other hand, it should not be confused with various "healthy" combinations of rude and subtle emotions, like for example, the Awe that combines the profound Respect and sometimes Curiosity with Fear or Apprehension. Quite simply, corrupted feelings are addictive and spread like tumor, whereas healthy combinations are memorable and scarce.

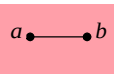
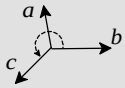
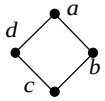
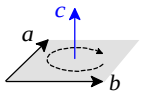
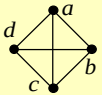
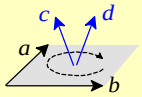
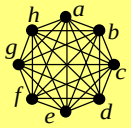
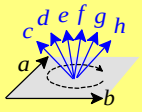
Other Analogies. The emotions' continuum can also be compared to the continuous wavelength scale that produces distinct colors, and electromagnetic field that produces photons and electrons. In a famous double-slit experiment photons and electrons behave like waves or particles, depending on whether they are counted or not. So are our emotions: they become distinctive, if we pay attention to them, but they dissipate, if we focus on something else. The distinction between the onion and apple models suggests that different wavelengths should produce different sets of colors, photons and electrons. This may relate to the color mesomerism and multiplicity of electron configurations and other quantum numbers.

3. Algebra of Emotions

Vectors of Emotions. Each petal of the Plutchik's wheel can be viewed as an independent emotions' scale. Any two independent scales form a pair of orthogonal vectors, so

that oscillating networks can be represented as vector systems in Table 1. It relates emotions to algebraic dimensionality – a number of opposing views that form a synchronized system, or a "Higher Truth". Such "Truths" explain our perceptions of space, time, causality, morality and intellect.

Table 1. Oscillators vs. Vector Transformations

Oscillators	Edges	Vectors	Dim[a)]	Edge *a*-*b* is	Rotat[b)]	Commutativity	T-Arrow[c)]	Maslow
	1		1	Product of real numbers	1	Commutative AB = BA	No	Physiol.
	3		2	Product of complex numbers	3	Commutative AB = BA	No	Safety
	4		3	Cross product of vectors	3	Right hand rule Chirality	Yes	Belonging
	6		4	Product of quaternions	6	Non-commutat. AB ≠ BA	Yes	Esteem
	28		8	Product of octonions	28	Non-associativity (AB)C ≠ A(BC)	"Deeper" Yes	Self-actu-alization

[a)] Number of dimensions. [b)] Number of rotations' combinations, or pairs of vectors. [c)] Time Arrow

T-Symmetry and Egocentrism. The red and grey emotions represent just 1- and 2-dimensional vector operations, corresponding to the real (scalar) and complex numbers. Such operations are commutative, *i.e.* indifferent to the order of events. In other words, the cause and effect are interchangeable. For example, the abovementioned cycle "Over-confidence – Self-Indulgence – Stubbornness" can go in both directions, from left to right and backwards. In quantum physics it is known as time reversal or T-symmetry, Loschmidt's paradox, and quantum

entanglement. But on a human scale it relates to "commutative memories and visions", coupled with the onion model and egocentrism.

Causality and Time Travel. The white and yellow zones correspond to the cross-product of ordinary vectors (according to the right-hand rule) and quaternions (the 4-dimensional extensions of complex numbers). These are non-commutative operations ($AB \neq BA$), meaning that the cause is different from the effect, and the sequence of events becomes important. Consider the abovementioned example: "Optimism (2-b) → Humility (6-b) → Calm (10-b) → Persistence (14-b) →". Reversing this cycle may pull us to the lower zone which is indifferent to the sequence of transformations: "Over-Confidence (2-c) – Conformity (6-c) – Pessimism (10-c) – Stubbornness (14-b)". This may go unnoticed due to the deceptive nature of the grey zone and the "smoothness" of degradation. Very roughly it may follow the dotted spiral lines in Figure 2(A), which may also be compared to the widening hysteresis loops of imperfect system. On the other hand, if somehow we could manage going backwards non-commutatively, we would create the time travel possibility.

Theories of Everything. The brighter yellow zone (in the last row) corresponds to the octonions, 8-dimensional extensions of complex numbers, that are non-associative ($(AB)C \neq A(BC)$), revealing even deeper inequality between the cause and effect. At the same time they are more synchronized. Octonions were used to derive a geometric theory of everything (Lisi et al, 2010) and more sophisticated composition algebras describing the entire physical reality (Furey, 2016; Weinstein, 2020).

All of this suggests that the reality represents the deeper level of synchronized emotions. Subtle emotions appear differently from inside than from outside. Intrinsically they represent a complex network of causalities, but externally they look like a subtle synchronized oscillation.

As we will see below, these are such (barely noticeable) oscillations that define all physical laws and evolution. Note that octonions are not the last frontier, as more complex composition algebras are also possible.

Space – Time Perceptions. To summarize, the lower emotions shrink the space to just one or two dimensions, while stretching the time into a "directionless continuum". The higher emotions expand space (and any other concepts) to multiple dimensions, while shrinking the time to the "single point vector". The multidimensional perception enables us to perceive any situation from many points of view, whereas the single point vector explains the paradox of the "arrow of time" (as we will see below).

Isomorphism. The numbers of the edges (couplings) in the oscillating graphs coincide with the numbers of pairwise rotations in respective vector systems. The only exception is in 3-dimensional case (the white zone), which is not isomorphic to the real and complex numbers. The Hurwitz theorem for composition algebras implies that mutliplication of two vectors (as sums of squares) yields the third vector (sum of squares) only in dimensions 1, 2, 4, and 8. This may explain why the white zone is asynchronous and unstable.

4. The „Normal Settlement"

Solar Cycles. Harvey (2019) noted the importance of the „normal settlement" in circular causation. Self-regulation only works in the „natural" sequence of events. Table 2 shows that the sequence of the Plutchik's wheel corresponds to the solar cycles, as well as Russel's (1980) circumplex, meaning that the given sequence (at least in general) cannot be changed.

Table 2. *Changes of Emotions vs. Sleep – Wake Cycles*.

Hours, Seasons	Mild emotions [a)]			(D) Russel (1980)
	(A) Natural	(B) Plutchik‘s	(C) Inverted	
Night, Winter	Sleep, stillness, calmness	Boredom Pensiveness	Restrain Pensiveness	Bored Depressed Frustrated
Morning, Spring	Striving, aspiration, playfulness	Distraction Apprehens.	Surprise Carefulness	Angry Tense Excited
Day, Summer	Joy, confidence, curiosity	Acceptance Serenity Interest	Trust Joy Interest	Happy Delighted Content
Evening, Autumn	Flexibility, empathy, release, relax	Annoyance Boredom	Firmness Restrain	Relaxed Calm Tired

[a)] Gray background indicates borderline or rude emotions, white – „vitally-gentle“ emotions

Natural Rhythms. Indeed, during the night and winter time we are (as most of nature is) much less active than during the day and summer. Similarly, during the morning and spring time we are much more striving than during the evening or autumn. Changing this order disrupts the circadian and circannual rhythms, causing emotional dysregulation, fatique and sleepiness (McClung, 2013), as well as suppressing reproduction and increasing chances of suicides (Swaab et al, 1996). This can be compared to mixing the rainbow colors in an arbitrary order, whereby adjacent colors cancel each other out, thus „loosing hue“ and becoming dimmer.

Ortogonal Interactions. The cancelling effect is sharpened by the „catalytic“ relation between the orthogonal pairs, as exemplified in Figure 4. Case (A) shows that Joy (1-b) and Pensiveness (9-b) transform to Serenity (1-a) and Wisdom (1-a), as Firmness (5-b) and

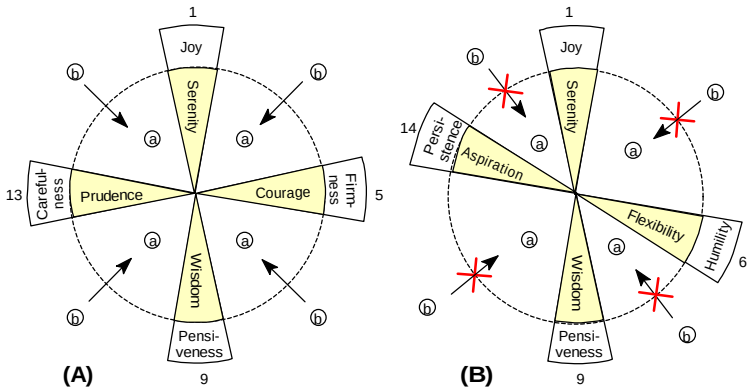


Figure 4. Perpendicular pairs of oppositions facilitate unification for each other (A), whereas non-perpendicular remain neutral (B)

Carefulness (13-b) transform to Courage (5-a) and Prudence (13-a). This is a „mutually beneficial“ process, as both pairs catalyze each other‘s transformation while preserving the „mutual neutrality“. But if they deviated from orthogonality, their transformations would become much more difficult. Case (B) shows that Joy (1-b) and Pensiveness (9-b) do not enter into a similar raletionship with Humility (6-b) and Persistence (14-b). No matter how persistent or humble one will be, he will hardly gain Serenity (1-a) or Wisdom (9-a). And *vice versa*, no matter how joyful and pensive one will be, he will hardly gain Flexibility (6-a) and Aspiration (14-a).

Effect on Arousal. Thus even slight changes in the circular sequence may have significant impact on the quality of emotions. Perhaps this is why broken cyrcadian rhythm suppresses the arousal (Schimmack et al, 2002), and children percieve the reality in sharper colors than adults (Taylor, 2007). Quite simply, children follow the natural order of emotions, whereas adults mix them „as needed“. This means that children have more chances for travelling in time and transforming the „tangible reality“. On the other hand, this also requires more

wisdom: „One who lives in accordance with nature does not go against the way of things. He moves in harmony with the present moment always knowing the truth of just what to do“ (Lao Tzu).

Induction of Dimensions. Above we saw that the correct sequence of transformations helps us to evolve, whereas the incorrect sequence causes degradation. This is comparable to the “right hand rule” that creates electromegnetic induction, mechanical torque, and centripetal (Coriolis) force. The only difference is that in our case the 3rd vector represents the algebraic dimensionality from Table 1.

Imagine that oscillating networks form the more sophisticated constructs, like atoms form molecules, and molecules form macromolecules and tissues. The high enough speed of transformation (and the large enough area of the „transforming stuff)“ create the centripetal force – the inherent Desire to Evolve – that overrules the „shallow“ Pleasure. So we start doing something unrelated to what we usually do. Thus a new orthogonal dimension is being born. A strong Will and Faith are required to complete the process, as it is not supported by the consciousness – that‘s why it is orthogonal! – and the white zone is not synchronized.

Implosion *vs* Explosion. If we honestly complete this enedavor, then we get to the „higher functioning state“, as described by Taylor (2010, 2011). Most often it looks like the „implosive evolution“ – not quite visible from outside, but very significant from the inside. The higher dimensionality yields the higher subtlety and lowers the intensity.

However, if we fail to do this properly, then we may get „corrupt“ – the oscillating constructs may not be coupled properly, as if macromolecules and tissues were lacking vital bonding. This yields explosive expansion along the old coordinates, like „fluffy yiest“ or tumor

cells that try to occupy the space. As amorpous body denies the crystallinity, so corrupt psyche denies the higher dimensionality, thus being insensitive to positive appraisal mechanisms.

Maslow Hierarchy. Table 1 shows that the dimensionality vector correlates with the Maslow‘s hiererchy. Originally Maslow (1954) suggested that his heararchy is irreversible, but modern scholars consider otherwise (Decker, 2018). Maslow implied „honest“ development of psyche, like crystal structure, where new layers gradually increase interconnectedness of the deeper layers. But modern people develop „fluffy networks“ comparable to amorphous porrige, chameleonically changing external form , but not so much the structure. This surely affects their value system, putting the onion model above the apple. The reversible psyche questions the irreversibility of evolution and morality in general.

Arrow of Time. The evolution becomes irreversible, when the cause becomes „stably“ different from the effect. As mentioned above, this only happens in the yellow zone. For a long time, the Arrow of Time was thought to increase the “disorder”. But now it is thought to increase the self-organization (England, 2020). The higher dimensionality dissipates energy much more efficiently than extensive self-replication, let alone the chaos. According to the almost century-old Lotka’s maximum power principle, evolution goes toward the maximum rate of “useful transformations” (Odum, 1995). This implies the “implosive” evolution with maximum internal sophistication, but minimum external expansion. That’s why “the supreme rulers are hardly known by their subjects” (Tao Te Ching chapter)

5. Empirical Correlations

All of the above suggest that the classical emotions‘ scales require serious reconsideration, as they depend on the emotions‘ sequence and person‘s wisdom and maturity.

This explains why their measurement is highly subjective (see *e.g.* Yik *et al.*, 1999), although does not preclude from observing various correlations. Figure 5 shows some examples.

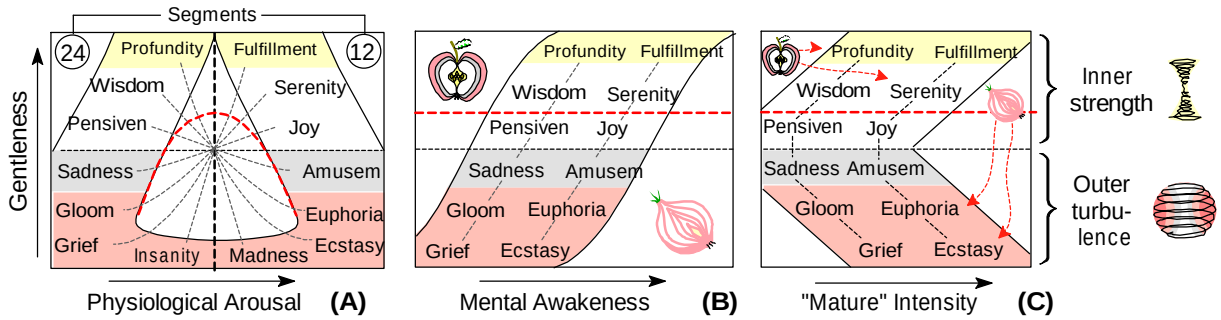


Figure 5. Dependences for Opposite Segments from Atlas of Feelings

Yerkes – Dodson Law. The upper part of plot A in Figure 5 reminds of the Yerkes and Dodson (1908) law, by which the maximum performance is achieved under the optimum dose of stress or stimulants (like coffeine). This yields the red dashed line with only moderate performance at the extremum. In real life it can be much higher, due to the higher diversity and subtlety of emotions. Plot B shows this by a dashed horizontal line. Stress and stimulants can induce our mood and concentration, but not wisdom, proficiency, serenity, fulfillment.

Russell's Circumplex. The lower part of plot A reminds of the circumplex model of affect by Russell (1980). As above, the circular shape can be explained by the dominance of physiology over the elasticity and appraisal. On the other hand, this dependence may not hold for other segments of emotions. For example, segments 6 and 17 (from Figure 3) are driven by Flexibility and Aspiration that have comparable arousal (as opposed to Pensiveness and Joy). This may explain why Russell's circumplex has limited applicability (as noted by Kuppens et al, 2013).

„Mature“ Intensity. Plot C shows an idealized dependence of the „vital gentleness“ on the „mature intensity“, represented as superposition of the „acquired inner srength“ and „physiological turbulence“. It is similar to the V-shaped dependences found by Watson et al (1985) and Bradley et al (1992, 1999), but differs by the locations of certain data points. The classical plot represents Euphoria and Ecstasy as pleasant, whereas Serenity and Fulfillment as un-intense (like in Figure 2). In our plot they are shifted along the red arrows.

Conclusios

Emotions carry much more information, and define our reality to a much greater extend, than we usually assume. In addition, there are higher „functioning states“ that we tend to ignore. These conclusions are not new (see *e.g*. James, 1890; Strongman, 2003; Taylor, 2010, 2011), but the corrupted psyche tends to diminish or deny them whatsoever. The vortex of emotions can help us to identify and overcome corruption through suggesting the „zoning“ of emotions, their dialectical (orthogonal) relations, and natural sequence(s). It also suggests a deeper view in the emotions‘ circular causation, self-regulation, and non-commutative transformations.

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